

Production Efficiency and Health of Farm Households in Ogun and Oyo States Nigeria

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Abstract. Good health is an asset for agriculture, as healthy people can produce more and good nutrition contributes to it. The study was carried out in Ogun and Oyo states in South-west Nigeria. The broad objective of the study was to analyse the effect of health on agricultural production efficiency in Ogun and Oyo States. Specifically, the objectives of the study were to describe socioeconomic characteristics and prevailing illness of farm household; estimate the production efficiency among the farm households and to determine the effect of health on production efficiency of the farm households in the study area. The sampling technique that was adopted for this study is Multi-stage sampling techniques and 450 respondents were randomly selected from the two states. The primary data for the study were analysed by a combination of descriptive statistics, Data Envelopment Analysis (DEA) and Tobit regression methods. Results revealed that technical efficiency among the respondents varied substantially between 0.51 and 1.00, with a mean technical efficiency of 0.76. The mean allocative and economic efficiency of farm households are 0.71 and 0.53 respectively. The two limit Tobit model was used to analyze the effects of various socio-economic characteristics of the farm households on the production efficiency. The data envelopment analysis revealed that inefficiencies exist among farming households hence there is need to improve the output of farmers. The study therefore concludes that production efficiency of farm household is significantly impaired by ill health, most especially the incidence of malaria.

Keywords: Agriculture, Health, Efficiency, Nigeria

1. Introduction

Agriculture and health are linked in various ways. These links are bidirectional: agriculture influences health and health influences agriculture. As depicted in the framework developed by Hawkes and Ruel (2006), the entire agricultural supply chain—agricultural producers, agricultural systems, and agricultural outputs—have implications for health through critical intermediary processes, which are the labor process, environmental change, income generation, and access to food, water, land, and health related services. Poor agricultural households tend to be vulnerable to malnutrition and poor health; agricultural systems interact with the environment, and by so doing affect human health; and agriculture produces foods, fibers, and plants with medicinal properties essential for human life and health.

The linkage between agriculture, health and nutrition is bi-directional, and so health and nutrition also affect agricultural system. Poor health brings hardships to households including diseases, substantial monetary expenditures, loss of labour, and sometimes death. Poor health lessens the farmer's ability to innovate, experiment, and operationalize changes in agricultural production. A farmer who is ill cannot attend a Farmer Field School or interact with an extension officer to learn about new technologies and improved practices in agricultural production, and so may lack the knowledge to innovate. Most often, innovation requires the purchase of improved seeds, fertilizers, poultry feeds, drugs, or other inputs and this may not be affordable for poor farmers after spending their money on healthcare. When the innovation involves additional labour (for example, farming practices like application of fertilizer and herbicides, picking of eggs in a battery cage), it is difficult for households with sick members to adopt the practice.

Experimentation on technology adoption and improved practices would be too costly for a farm household that is spending a lot of money on healthcare and is losing labour to illness. Health also affects agricultural output, particularly its demand. Malnutrition and disease patterns influence market demand for food quantity, quality, diversity, and the price people are able or willing to pay. Nutrition affects people's health and is an important factor in farm labour productivity. Past nutritional status predicts the probability of developing chronic diseases and consequently, influences labour force participation (Sur and Senauer, 1999).

The nutrition and health status of adults affects the duration of labour force participation and the intensity of work effort. Poor health will result in a loss of days worked or in reduced worker capacity, and is likely to reduce output (Antle and Pingali, 1994). Limited access to food may occur in a household if individuals are too ill or overburdened to produce or earn money to buy food (Keverenge-Ettsyang *et al.*, 2010). Based on the premise that wages reflect the marginal productivity of labour, Sur and Senauer (1999) looked at the link between nutrition and health, and labour productivity by estimating wage equations from individuals participating in the wage labour force in rural Bangladesh. Height, which was used as an indicator of long-term health status, was found to be a significant determinant of labour force participation in agricultural wage labour but not for non-agricultural wage labour. Good nutrition has been found to be crucial for both children's physical and cognitive development and for their productivity and earnings as adults. The Lancet reported that boys who benefited from a randomized nutrition intervention during conception and in their first two years of life earned 50% more wages than those of non-participants, when both groups became adults (Hoddinott *et al.*, 2008).

A common mechanism households adopt to cope with the burden of high medical costs is reducing consumption of basic needs, including food (Pitayanon *et al.*, 1997). If consumption reduction is substantial, this can lead to malnutrition which increases susceptibility to opportunistic diseases for AIDS patients. Malnutrition weakens the immune system, increasing the risk of ill-health, which in turn can aggravate malnutrition. The World Health Organization identifies malnutrition as "the single most important risk factor for disease." In developing countries, poor nutrition is a massive problem making people more susceptible to diseases.

Many developing-country governments are increasingly concerned with the basic needs of their

populations, and health and nutrition projects account for rising public sector expenditures. However, under tight budget constraints choices need to be made where resources are best spent. The government of Nigeria thus faces the key challenge of ensuring consistency of policies and strategies to promote long-term economic growth in the agricultural sub sector, raise smallholder productivity, achieve food security, and reduce poverty, among farmers while providing the social services that meet their immediate welfare needs. One way to solve this conundrum is to devise strategies that maximize the contribution of social services to productivity in agriculture. Expenditures relating to human capital formation can be more easily justified in terms of promoting economic development and, thus, generate a large increase in productivity. Unlike the issue of returns to education, as yet there have been comparatively few empirical studies, especially in developing countries, on the linkages between the trio, health, nutrition and agricultural productivity especially among rural farmers.

The broad objective of the study was to analyse the effect of health on agricultural production efficiency in Ogun and Oyo States.

The specific objectives were to:

- describe socioeconomic characteristics and prevailing illness of farm household
- estimate the production efficiency among the farm households
- determine the effect of health on production efficiency of the farm households in the study area.

2. Methodology

2.1 Study Area: The study was carried out in Ogun and Oyo states in South-west Nigeria.

2.2 Sampling Technique and Sample Size: The sampling technique that was adopted for this study is Multi-stage sampling techniques. It entailed dividing a state into clusters based on geographical areas by considering various demographic and natural characteristics. These clusters were then numbered, randomized and the chosen ones picked and studied.

At the first stage, two states (Oyo and Ogun) were purposively selected based on higher population of rural farmers in these states and availability of market for agricultural products. Thereafter, three zones based on the division of Farmers Association of Nigeria (FAMAN) were randomly selected from each of the state. Thus, a total of six (6) zones were selected from the two (2) states. In the third stage,

three (3) Local Government Areas (LGAs) were selected from each of the zones making a total of eighteen (18) LGAs. At the fourth stage, five (5) villages were randomly selected from each LGAs resulting in a total of ninety (90) villages. Finally, in each of the ninety (90) selected villages, five (5) respondents engaged in farming were randomly selected giving a total of four hundred and fifty (450) respondents from the two states.

2.3 Analytical Technique: The data for the study were analysed by a combination of descriptive statistics, Data Envelopment Analysis (DEA) and Tobit regression methods.

3. Results and Discussion

3.1 Distribution of Farm Households by Personal Characteristics of Household Head

The socio-economic characteristics of farmers and their households are believed to have a direct or indirect relationship with their production activities, production efficiency and decision making process. These socio-economic characteristics are presented below. Most of the socio-economic characteristics discussed here are peculiar to the household head. This is because of the overwhelming influence the household head has on the household decision making process in traditional African setting most especially as it relates to farm production activities

(Ayinde, 2004). Age is believed to be an important factor in farming activities. Younger farmers are likely to commit more energy into production. On the other hand, older farmers are expected to have more experience which may impact positively on production efficiency. Ages of the farming household heads in the area are distributed across the various ranges in Table 1. A cumulative percent of 73.3 were below the age of fifty with a mean age 47 years which can be classified as active age for farmers in Ogun State while in Oyo State, a cumulative of 71.7 percent of the farming household heads in the area were less than 50 years of age. The mean age of farmers in this category was 46 years for households in Oyo State. This implies that majority of the farmers are still in their active age and are therefore expected to be productive and this will have positive effect on their efficiency, *ceteris paribus*. Distributions of Household Heads according to sex showed that majority (68 percent) of the household heads were male in Ogun State while among the Oyo State farmer households sampled 52.4 percent were male. This shows active involvement of men in farming in the study areas while women are more involved in the processing of agricultural products and marketing. Also, majority of the household head in Ogun state are married (91.9 percent) and had primary education (44.4percent) while 96.1 percent and 38 percent of household heads are married and have completed secondary education in Oyo state.

Table 1: Distribution of Farm Households by Personal Characteristics of Household Head

Characteristics	Ogun State		Oyo State		Total	
	Freq	Percent	Freq	Percent	Freq	Percent
Age(years)						
less or equal to 30	44	16.3	40	8.2	84	11.1
31-40	85	31.5	87	17.9	172	22.7
41-50	69	25.5	222	45.6	291	38.4
51-60	36	13.3	86	17.7	122	16.1
>60	36	13.3	52	10.7	88	11.6
Total	270	100	487	100	757	100
Mean	47		46		45	
Gender						
Female	84	31.1	232	47.6	316	41.7
Male	186	68.9	255	52.4	441	58.3
Total	270	100	487	100	757	100
Educational level						
None formally	62	23.0	67	13.8	129	17.0
Primary	120	44.4	56	11.5	176	23.2
Secondary	76	28.1	185	38.0	261	34.5
Tertiary	12	4.4	179	36.8	191	25.2
Total	270	100	487	100	757	100
Marital Status						
Single	15	5.6	18	3.7	33	4.4
Married	248	91.9	468	96.1	716	94.6
Widow	5	1.9	1	0.2	6	0.8
Divorced	2	0.7	0	0.0	2	0.3
Total	270	100	487	100	757	100

Household Type						
Head	191	70.7	264	54.2	455	60.1
Spouse	70	25.9	200	41.1	270	35.7
Others	9	3.3	23	4.7	32	4.2
Total	270	100	487	100	757	100
Household Size						
< 5	200	74.1	279	57.3	479	63.3
5-10	64	23.7	117	36.3	241	31.8
11-15	6	2.2	25	5.1	31	4.1
>15	-	0	6	1.2	6	0.8
Total	270	100	487	100	757	100
Mean	6		5		5	
Farm Size(acres)						
Less or equal to 1						
	24	12.1	5	1.2	29	4.7
1.01-5	125	62.8	119	28.1	244	39.2
5.01-10	25	12.6	144	34.0	169	27.2
10.01-15	14	7.0	64	15.1	78	12.5
15.01-20	0	0.0	20	4.7	20	3.2
Greater than 20	11	5.8	71	16.8	82	13.2
Total	199	100	423	100	622	
Mean	10		8		4	
Type of illness						
Malaria	116	89.9	156	71.9	272	78.6
Typhoid fever	5	3.9	22	10.1	27	7.8
Guinea worm/schistomiasis	0	0.0	16	7.4	16	4.6
Diarrhoea	0	0.0	2	0.9	2	0.6
Dysentery/pile	0	0.0	3	1.4	3	0.9
Cough	0	0.0	3	1.4	3	0.9
Cold/catarrh	4	3.1	8	3.7	12	3.5
Measles	0	0.0	1	0.5	1	0.3
Farm injuries	1	0.8	1	0.5	2	0.6
River blindness	2	1.6	0	0.0	2	0.9
Others	1	0.8	5	2.3	6	1.7

Source: Field Survey, 2017

It is expected that household members will serve as readily available source of farm labour to the farmers and this is expected to enhance efficiency. The mean household size in both states is 6 and 5 people respectively in Ogun and Oyo States. This shows that the two states sampled have access to family labour which is the cheapest form of farm labour supply and make use of hired labour in case of shortfall in the supply of family labour.

Land is the most important input for agricultural production but it is generally believed to be abundant relative to other inputs. Nigerian farms are classified into small scale, medium scale and large scale. According to Upton (1972) farm sizes classification of less than 5ha should be classified as small, between 5ha and 10ha as medium, and more than 10ha as large scale.

The household heads in the two states sampled are operating on an average farm size of 10 acres (4.05 ha) and 8 acres (3.24ha). Going by the classification of Upton (1972), all farm holdings by the respondents in the study area was classified as small scale farms. This corroborates the widely reported view that small-scale farmers constitute the nerve-centre of

food production in Nigeria (Olayide and Heady, 1998).

Table 1 also showed the details of the frequencies of occurrence of different disease among farming households in the two states considered. There were a total of one hundred and twenty-nine (129) illness episodes among the Ogun State farming households sampled within the last production seasons. One hundred and sixteen (89.9 percent) of the total illness episodes were due to malaria, 5(3.9 percent) were typhoid fever while 4(3.1 percent) were due to cold/catarrh. Other illness such as farm injuries, river blindness and others occurred less frequently. Meanwhile, among the Oyo State farming household, there were 217 episodes of illness out of which 156 (about 71.9 percent) were malaria, 10.1 percent were typhoid fever while 7.4 percent were guinea worm and other diseases that occurred less frequently. Egan (2001) posited that repeated bouts of malaria in agrarian households cause a decline in output, farm income, food security and poverty. He also added that because malaria strikes during rainy/harvest season, when workers productivity is at its highest leading to reduced agricultural production activities. According to Oladepo (2010), malaria-afflicted

farmers harvest only 40% of their crops compared with 100% of their malaria- non afflicted counterparts. Therefore, malaria constitutes a great burden on the already depressed Nigerian economy through its severe impact on the agricultural sector.

3.2 Data Envelopment Analysis for Production Efficiency

The result in Table 2 shows that technical efficiency among the respondents varied substantially ranging between 0.51 and 1.00, with a mean technical efficiency of 0.76. This result suggests that farm

households are not utilizing their production resources efficiently, indicating that they are not obtaining maximal output from their given quantum of inputs. In other words, technical efficiency among the respondents can be increased by 24% i.e. (1.00-0.76) through better use of available production resources, given the current state of technology and health. This would enable the farmers to obtain maximum output from their given quantum of inputs, and hence increase their farm incomes thereby reducing poverty. This validates claim by Asogwa *et al.* (2011) that Nigerian rural farmers do not obtain maximum output from their given quantity of inputs.

Table 2: Data envelopment analysis for production efficiency in Ogun and Oyo states of South Western Nigeria

	Ogun State		Oyo State		Total	
	Freq	%	Freq	%	Freq	%
Technical efficiency						
0.51-0.60	23	8.5	32	6.6	55	7.3
0.61-0.70	54	20	147	30.2	201	26.6
0.71-0.80	83	30.7	159	32.6	242	32
0.81-0.90	70	40	98	20.1	168	22.2
>0.90	40	14.8	51	10.5	91	12
Mean	0.77(0.0074)		0.74(0.0050)		0.76(0.0042)	
Mimimum	0.51		0.51		0.51	
Maximum	1		1		1	
Allocative efficiency						
0.41-0.50	0	0	8	1.6	8	1.1
0.51-0.60	10	3.7	59	12.1	69	9.1
0.61-0.70	82	30.4	208	42.7	290	38.3
0.71-0.80	111	41.1	174	35.7	285	37.6
0.81-0.90	61	22.6	36	7.4	97	12.8
>0.90	6	2.2	2	0.4	8	1.1
Mean	0.73(0.0051)		0.69(0.0037)		0.71(0.0031)	
Minimum	0.52		0.47		0.47	
Maximum	1		0.91		1	
Economic efficiency						
0.31-0.40	3	1.1	9	1.8	12	1.6
0.41-0.50	52	19.3	228	46.8	280	37
0.51-0.60	138	51.1	198	40.7	336	44.4
0.61-0.70	55	20.4	48	9.9	103	13.6
>0.71	22	8.1	4	0.8	26	3.4
Mean	0.56(0.0059)		0.51(0.0032)		0.53(0.0031)	
Minimum	0.38		0.36		0.37	
Maximum	1		0.83		1	

Source: Computed from Field Survey, 2017

3.3 Allocative Efficiency

The allocative efficiency of farm households in the study area ranges from 0.47 to 1 with a mean allocative efficiency of 0.71. The implication of this is that if an average farmer in the study area was to achieve the allocative efficiency level of its most efficient counterpart, then the average farmer could realize a 39 percent cost saving (1-0.71), in the same vein, for the most allocatively inefficient farmer reveals cost savings of 53percent(i.e., 1- 0.47).

3.4 Economic efficiency

The combined effect of technical and allocative factors shows the average economic efficiency level. In the study area, the average economic efficiency is 0.53 with a minimum of 0.37 and maximum value of 1.

3.5 Socioeconomic Factors affecting Efficiency of Farmers

Since the efficiency level generally ranges between limits of 0 and 1, the two limit Tobit model was used to analyze the effects of various socio-economic characteristics of the farm households on the production efficiency.

3.6 Technical efficiency

The result of the tobit regression result in Table 3 revealed that age (p<0.01), sex (p<0.01), years of education (p<0.01), years of experience (p<0.01), household size(p<0.05), credit access (p<0.10), economic cost of illness (p<0.05), type of illness (p<0.01), days loss to illness (p<0.01) and calorie intake (p<0.01) were the significant factors affecting technical efficiency of farmers in the study area. This study shows a negative relationship between time cost of illness and efficiency. Increasing the time cost of illness by one naira decreased the level of technical efficiency by 11.4%. As the number of day’s loss due to ill-health increases, farming households tend to be less efficient technically. This further revealed that as farm households’ losses more

work days to illness, technical efficiency decreases. Also, a positive relationship existed between financial cost of illness and efficiency. This implies that as farmers spends more on their health; technical efficiency increases probably due to the fact that farmers spend more on their health so as to reduce the number of day loss to illness. Age of household head was significant and positive.

3.7 Allocative efficiency

The age of the household head increases significantly with a decrease in allocative efficiency. Female headed households are more cost efficient than their male counterparts. Increase in years of experience and education of household head also increases their efficiency. Alternatively, increase in household size decreases the efficiency level of farmers. Increase in protein intake and economic cost of illness significantly influences allocative efficiency of farmers in the study area.

Table 3: Determinant of Production Efficiency of Farm Households in Ogun and Oyo States

	Technical efficiency	Allocative efficiency	Economic efficiency
State (dummy)	0.3205** (2.7655)	1.6452*** (13.412)	1.4623*** (11.760)
Age	0.0421*** (8.8170)	-0.0362*** (-7.229)	-0.01004* (-1.9626)
Gender (dummy)	-1.6473*** (-17.702)	0.41694*** (4.9085)	-0.44826*** (-4.9313)
Years of education	-0.12623*** (-13.519)	0.0364*** (4.1620)	-0.0205** (-2.2193)
Farming experience	-0.14782*** (-25.449)	0.0655*** (13.941)	-0.0055 (-1.1923)
Household size	0.00219 (0.1498)	-0.21136*** (-11.217)	-0.2299*** (-10.405)
Credit (dummy)	-1.2911*** (-11.462)	-1.2558*** (-11.349)	-1.5675*** (-13.285)
Economic cost of illness	-0.000208*** (-7.4641)	0.00012*** (4.654)	0.00003 (1.1698)
Type of illness	-0.85743*** (-9.4314)	-0.23555** (-2.5891)	-0.5872*** (-6.099)
Days loss to illness	0.14525*** (18.698)	-0.00286 (-0.4140)	0.0450*** (6.0270)
Episode of illness	-0.008711 (-0.1215)	-0.028*** (-3.7983)	-0.0245*** (-3.0324)
Total calorie	0.00065*** (7.2796)	-0.00033*** (-3.7555)	-0.00019** (-2.0801)
Total protein	-0.0266** (-2.0509)	0.0897*** (6.7634)	0.056*** (3.9917)
Constant	56.514*** (30.244)	24.245*** (23.894)	18.558*** (20.803)
Log likelihood function	1244.09	837.12	646.15
Mean square error	0.00032	0.00063	0.00064

Figures in parenthesis are t-ratios

3.8 Economic efficiency

Sex (p<0.05), household size (p<0.01), credit access (p<0.01), economic cost of illness (p<0.10), type of illness (p<0.05), days loss to illness (p<0.05), episode

of illness (p<0.05) and protein intake (p<0.05) were the significant factors affecting economic efficiency of farmers in the study area. The age of the household head increases significantly with a decrease in economic efficiency. Female headed households are

more economic efficient than their male counterparts. Increase in years of experience and education of household head also increases their economic efficiency. Alternatively, increase in household size decreases the economic efficiency of farmers.

4. Conclusion

More days were generally lost to malaria and typhoid fever in the study area. The costs spent on illness in the household negatively affect production efficiency due to a break in farming activities during illness and also taking care of sick person. Farmers spend more on their health; technical efficiency increases probably due to the fact that farmers spend more on their health so as to reduce the number of day loss to illness. The data envelopment analysis revealed that inefficiencies exist among farming households hence there is need to improve the output of farmers.

The study therefore concludes that production efficiency of farm household is significantly impaired by ill health, most especially the incidence of malaria. Based on the findings, the study recommends the following:

- Farmers should be advised to improve the nutrition quality for both calorie and protein intake in order to meet up with the recommended daily allowance and also to enhance efficiency.
- Primary health care needs to be developed further and made accessible to the rural farmers. At the same time, the burden of disease can be lowered if the prevalence of disease is reduced with carefully planned agricultural development thereby reducing the number of days of forgone production activities due to ill-health.

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